Natural Light is the Cause of the Effects of Architecture

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Abstract

Throughout history designers have attempted to introduce light in a way that an observer will be conscious of the effect of light while the light source itself is played down in the architectural composition. When light-transmitting (rather than opaque) material are prominently involved in the lighting unit itself, the units become architectural forms and surfaces as well as lighting elements. Such 'self-luminous' elements help to visually define a space and are important to the general organization of the room. According to medieval thinkers, light was the source and essence of all visual beauty, and is the principle of order and value. In a Romanesque church light is something distinct from and contrasting with the heavy somber tactile substance of the walls. The gothic wall in contrast seems to be porous, light filters through it. The gradual enlarging of the window openings as such is not the most important manifestation of this process. The sensitizing of the mass in terms of its role as either reflection or obstruction of the light flow radically transforms the dynamics of the relationship and leads to an absolute plastic continuity of the architectonic member to a rigorously logical connection of the elements.

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Introduction

Before 1750 it was well known that the Greeks had made the windows narrower at the top than at the bottom. Not only was this arrangement recorded by Vitruvius, but it could be seen in such Roman ruins as the round temple at Tivoli. The most moderate Greek Revivalists recognized the practical advantages of windows narrower at the top whilst the more fanatical did not use windows at all but their temples were lit only by the doorway. Such prototypes had been disregarded because the arrangement was so ill-suited to hinged or sliding windows although it is characteristic of the spirit of English Palladianism that it was used by Lord Burlington in the courtyard of his own house. It is sufficient to say that the destruction of such traditional fenestration patterns has been one of the most persistent architectural characters of the modern age. Abbot Suger of St. Denis wrote on the importance of light and related it only to the material quality of the illuminated surface. He relates light primarily to the preciousness of gold, stone, and glass. Light to Suger meant brightness, which had to impress. Panofsky introduced the principle of transparency as the visual representation of the intellectual Manifesto. Transparency implies light penetration through the wall which is coming from outside. Such an idea was opposed to a thesis by Jantzen who tried to demonstrate that the stained-glass windows themselves were the source of light, framed by the intangible obscurity of interior space itself.

According to Jantzen and Schoine, Gothic light cannot be considered as transparent light, as Panofsky later believed, but in fact is unnatural light, born from the stained-glass window.

The Gothic age was an age of vision. The supernatural manifested itself to the sense. In the religious life of the 12th and 13th centuries, the desire to behold sacred reality with bodily eyes appears as a dominant motif. The Gothic cathedral was described as an image of the celestial city. Two aspects of gothic architecture are the use of light and the unique relationship between structure and appearance. By the use of light, I mean the relation of light to the material substance of the wall. In a Romanesque church light is something distinct from and contrasting with the heavy somber tactile substance of the walls. The gothic wall seems to be porous, light filters through it. The stained-glass windows of the gothic replaced the colored walls of Romanesque architecture. The gradual enlarging of the window openings as such is not the most important manifestation of this process. No segment of inner space could look dark. High Gothic architecture is dominated by what may be called the principle of transparency.

The window is employed at present exclusively as part of the façade, as if it consisted of a kind of embellishment like columns or woodwork. It no longer has the shape or size which the room requires to illuminate it, but rather must attain itself to the rhythm of the façade. It is no longer positioned where it is needed in the room, but rather where it is needed in the façade. Normal consciousness, perception can be maintained only in a constantly changing environment. Where there is no change a state of sensory deprivation occurs. Experiment has shown that a homogeneous and unvarying environment produces boredom, restlessness, lack of concentration and reduction in intelligence. A change in environment stimulates our built-in devices to perceive and respond rapidly to significant events and efficiency is thereby increased. Strain occurs when the muscular system is pressed too hard for a long time.

Light and Beauty

For the 12th and 13th century light was the source and essence of all visual beauty. The development of the stained-glass windows impelled by the astonishing idea of replacing opaque walls by transparent ones to reflect the same taste. Light and luminous objects, no less than musical consonance, conveyed an insight into the perfection of the cosmos and a divination of the creator. According to medieval thinking, light is the principle of order and value. Their exterior walls pierced by continuous rows of windows let their interior space appear as a shallow transparent shell. The second striking feature of the Gothic style is the new relationship between function and form, structure and appearance. Here ornamentation is entirely subordinated to the pattern produced by the structural members, the vault ribs and supporting shafts, the aesthetic system is determined by these. Architectural forms reveal function in as much as it reveals the actual physical interplay of weights (or thrust and support). We cannot enter a Gothic church without feeling that every visible member of the great system has a job to do. There are no walls but only supports. The bulk and weight of the vault seem to have contracted with the web of the ribs. There is no inert matter, only active energy. The shafts express the principle of supporting by the dynamics of their vertical lines. The ribs represent the statically important ridges.

In Amiens Cathedral we are not forcibly pulled to the east as in the case of a Baroque church, since the light is evenly diffused from one end to the other. The sanctuary is backed by an ambulatory which is lighted by the windows of the radiating chapels that are barely visible from the west. Man could come to a closer understanding of the light of God through the light of material object in the physical world. In Cathedral Le Mans, France, the clerestory lighting of the inner aisle, and the light pouring in from the side chapels all combine to produce a lavish yet organized richness in which every part is necessary for either function or structural reason. Gothic construction makes adequate daylighting of the entire area possible by means of large stained-glass windows. For the 12th and 13th centuries light was the source and essence of all visual beauty. SS. Victor and Thomas Aquinas both ascribe to the beautiful two main characteristics: consonance of parts, or proportion, and luminosity. The stars of gold and precious stones are called beautiful because of the quality.

In the philosophical literature of the time no attributes are used more frequently to describe visual beauty than lucid, luminous, and clear. The aesthetic preference is vividly reflected in the decorative arts of the time with their obvious delight in glittering objects, shining materials and polished surfaces. According to the Platonizing metaphysics of the Middle Ages, light is the most noble of natural phenomena, the least material, the closest approximation of pure form. Light is the mediator between bodies and bodily substances, a spiritual body, an embodied spirit. For St. Bonaventure light is present in the earthly substances. St. Bonaventure remarkedly asks, “do not metals and precious stones begin to shine when we polish them, are not clear window frames manufactured from wood and ashes, is not fire struck from black coal, and is not this luminous quality of things evidence of the existence of light in them?

According to medieval thinkers, light is the principle of order and value. The objective value of a thing is determined by the degree to which it partakes of light. Incident light is modified by the effect of object size, simultaneous contrast, and viewing time (before we perceive minimum variations in lightness of approximate 2 to 1). Leonardo da Vinci observed, if you see a white cloth side by side with black one, it is certain that the part of the cloth which is next to the black will seem whiter by far than if the part is next to something whiter than itself. The choice of material with different reflectance can have a marked effect upon the pattern of brightness in an interior. This is not only affect the brightness of each surface but also the proportion of indirect light in the room. Consequently, a higher proportion of indirect light will have soft contrast and gentle modeling.

Luminous Environments

Most people are more satisfied with the appearance of an interior when the light flows mainly from one direction. Our discomfort increases when visual noise is irrelevant and confusing signals dominate the field of vision and interferes with the ability to perceive relevant useful facts about the nature of the environment or the progress of activities. Seeing involves the brain as well as the eye, and through prior experience the brain plays a major role in determining which characteristics of objects make them worthy of attention. Since the brain is constantly

monitoring the visual environment for new information which might be of significance for biological activities or needs, things which are expected or which contrast with their visual backgrounds because of some unusual quality are likely to be treated as figures by the visual processing system attracting the attention of the beholder. The brain analyzes and perceives the entire visual field and not its individual aspects. It detects the patterns of light sources and the nature of their relationships to other elements in the visual field which largely determine the overall quality of the luminous environment, which is much less important in lighting design than consideration of the terms of distribution and characteristics.

We are comfortable when we are free to focus our attention on what we want or need to see, when the information we seek is clearly visible and confirms our desires and our expectations, and when the background does not compete for our attention in a distracting way. Increasing the light on an object can increase its visibility or can decrease it depending on the quality of the illumination far more than on the quantity of light provided. Flexibility and quality not sheer quantity are the essentials of a good multiuse luminous environment. Luminous environments in which biologically necessary information is unavailable, confused or overpowered provoke feelings of dissatisfaction and discomfort. High luminous backgrounds tend to dominate the visual field causing the eye to reduce the amount of light on the retina thus interfering with the perception of the person.

A well-known example of a disorienting space is the exhibition gallery in the Guggenheim Museum in New York, U.S.A where many people are somewhat uncomfortable in this space because they cannot tell whether to stand perpendicular to the gently sloping floor or parallel to the pictures which are hung on a tilted wall to the outside. We expect floors to be flat because most floors which we experience are flat. When we encounter a sloping floor, without clear visual signals that it in fact is sloping our expectation tells us that the floor is probably flat while the inner ear tells us something quite different. We react favorably to stained glass windows on the other hand because this substitutes for another desirable form of positive visual experience for the view which they replace. Manning has demonstrated that the daylight is desirable, not only because of its illumination and special qualities, but because of the view which is usually associated with the daylight. North facing clear windows are particularly valuable because they require no solar control devices, which often destroy the view that the window was intended to provide in the first place. Through many types of sun-screening, heavily mullioned windows or venetian blinds is uncomfortable because of undesirable competition between the elements of the glazing plane and the view beyond.

Unclassifiable or ambiguous visual stimuli demand further visual attention. The immediate awareness of a stimulus is largely a function of the association which can be made in the experience filter and of the relevance of the stimulus to current needs for environmental information. It is the interpretation and the relevant meaning of the stimulus which determine the relative importance which will be assigned during the process of perception, and whether it will be perceived as a useful signal or as counter productive visual noise. Seeing is not a passive response to patterns of light, rather it is an active information-seeking process directed and

interpreted by the brain. Visual sensory data are coordinated with incoming contextual information from other senses related to past experiences of a comparable nature, and given attention (or not) depending on whether the incoming stimulus is classified as signal or noise. It is the information contrast context of a stimulus, not its absolute magnitude, which generally determines its relevance and importance.

Conclusion

In the entrance of Le Corbusier's Jeanneret House, Paris 1933, we find overlapping blocks of space lit from behind, thus always suggesting something beyond. Instead of the eye and mind being abruptly halted by edges and contained surfaces they are led continuously on in exploration never quite comprehending the mystery of layered and veiled space.

Throughout history some designers have attempted to introduce light in a way that the observer will be conscious of the effect of the light while the light source itself is played down in the architectural composition. For example, in some Byzantine churches, small unobstructed windows were placed at the base of a dome to light his large structural element. The brilliant dome then became a major focal element, and serving as a huge reflector, the dome (not the windows) became the apparent primary light source for the interior space. Similarly, the windows in some baroque interiors were place so they were somewhat concealed from the normal view of the observer and the observer's attention was focused on a brightly lighted adjacent decorative wall. In both cases the objective was to place the emphasis on the surfaces to be lighted while minimizing any distracting influence from the lighting system itself.

When light-transmitting (rather than opaque) material are prominently involved in the lighting unit itself, the units become architectural forms and surfaces as well as lighting elements. Such self-luminous elements help to visually define a space and are important to the general organization of the room. The Gothic architect developed his plan by strictly geometric means, using as modules certain regular polygons above all the squares. All the ribs under the vault of Reims Cathedral circumscribe according to Viollet Le Duc equilateral triangles. If the architect designed his sanctuary according to the laws of harmonious proportion, those who looked at his work judged it as an image of that truth, hence the medieval tendency to praise or condemn a work of art in terms of the ultimate religious experience.

It is the meaning of bright sources in the visual field, and not merely their surface luminance or size which determines our emotional responses to them. The sensitizing of the mass in terms of its role as either reflection or obstruction of the light flow radically transforms the dynamics of the relationship and leads to an absolute plastic continuity of the architectonic member to a rigorously logical connection of the elements clarified in every point with insistent precision.